In[117]:=

```
newtonDD[x_List, y_List] :=
 Module[{n = Length[x], dd},
 dd = Table[0, {n}, {n}];

 (* First column = y values *)
 Do[dd[[i, 1]] = y[[i]], {i, 1, n}];

 (* Fill the divided difference table *)
 For[j = 2, j ≤ n, j++,
  For[i = 1, i ≤ n - j + 1, i++,
  dd[[i, j]] = (dd[[i + 1, j - 1]] - dd[[i, j - 1]])/(x[[i + j - 1]] - x[[i]]);
  ]
 ];

 dd
 ]
```

In[118]:=

```
newtonPolynomial[x_List, y_List, var_] :=
 Module[{dd = newtonDD[x, y], n = Length[x], poly, term},

 poly = dd[[1, 1]]; (* First term *)

 For[i = 2, i ≤ n, i++,
  term = dd[[1, i]] * Product[(var - x[[k]]), {k, 1, i - 1}];
  poly = poly + term;
 ];

 Expand[poly]
 ]
```

In[119]:=

```
nodes = {0, 1, 3};
values = {1, 3, 55};

P = newtonPolynomial[nodes, values, x]
```

Out[121]=

$$1 - 6\,x + 8\,x^2$$